

Table 1

	Hard Coating	Oxidation Process		Deposition Process of Alumina Coating			Measurement Result of Alumina Coating		
		Substrate Temp.	Heating Time	Power	Number of sputtering sources used	Substrate Temp.	Film Thickness	I $\alpha$ I $\gamma$	Crystal Structure
Inventive Case 1	TiAlN	780°C	20 min	3 kW	2	780°C	2 $\mu$ m	$\gamma$ -peak detected <sup>1</sup>	$\alpha$ -type
Comparative Case 1	TiAlN+CrN						2 $\mu$ m	$\gamma$ -peak detected <sup>1</sup>	$\alpha$ -type
Inventive Case 2	TiAlN	750°C	20 min	3 kW	1	770°C	1.15 $\mu$ m	2.8	$\alpha$ -type: main, $\gamma$ -type: sub
Inventive Case 3	TiAlCzN						1.15 $\mu$ m	2.9	$\alpha$ -type: main $\gamma$ -type: sub
Inventive Case 4	TiAlN	740°C	60 min	3 kW	1	770°C	0.9 $\mu$ m	$\gamma$ -type detected <sup>1</sup>	$\alpha$ -type
Comparative Case 2	TiAlN	635°C	20 min	3 kW	1	670°C	1.3 $\mu$ m	1.4	Mix of $\alpha$ -type and $\gamma$ -type
Comparative Case 3	TiAlN	530°C	20 min	3 kW	2	590°C	2 $\mu$ m	$\alpha$ -type detected <sup>2</sup>	$\gamma$ -type

\*1: Peak of  $2\theta = 19.450^\circ$  is not detected.\*2: Peak of  $2\theta = 25.5761^\circ$  is not detected.

Table 2

Hard Coating	Oxidation Process		Deposition Process of Alumina Coating		Measurement Result of Alumina Coating			
	Substrate Temp.	Heating Time	Substrate Temp.	Average Discharge Power (total of 2)	Deposition Time	Film Thickness	I $\alpha/\gamma$	Crystal Structure
Inventive Case 1'	700°C	20 min	770°C	5.6 kW	3 hr	2 $\mu$ m	$\gamma$ -peak not detected*	$\alpha$ -type: main $\gamma$ -type: sub
Inventive Case 2'							$\gamma$ -peak not detected*	$\alpha$ -type: main $\gamma$ -type: sub
Reference Case							I $\alpha/\gamma$ = 6.4	$\alpha$ -type: main $\gamma$ -type: sub

\* Peak of  $2\theta = 19.450^\circ$  is not detected